

REMARKS

The claims in the application are 1-21 and Claims 22-25 added by the present amendment.

Favorable reconsideration of the application as amended is respectfully requested.

The claims have been amended to eliminate the rejection of Claims 2-4, 7 and 13-21 under 35 U.S.C. §112, second paragraph on pages 2-3 of the Office Action. In this regard, it is respectfully pointed out Claim 21 is directed to the specific structure of hydraulic means 1 having a cylinder divided into chambers 4, 5 by a piston 2 connected to a rod 3 and location of single valve 15 between pump 12 and chamber 4, so Claim 21 is not merely repetitive of independent Claim 1 (reference is being made to preferred embodiments of the present invention illustrated in the drawings of the present application).

Independent Claim 1 has also been amended to address the question of comprehension of the claims raised by the Examiner ("inasmuch as they [the claims] are definite") on page 3 of the Office Action in rejecting the claims over prior art. For example, the recitation "at most" before "a single valve" found at the end of independent Claim 1 has been deleted. The amendment to independent Claim 1 and Claims 22-25 added herein find clear support throughout the present application and drawing, e.g., on pages 10-11 of the specification.

Accordingly, the only outstanding issue is the prior art rejection of the claims.

More specifically, Claims 1, 2, 4, 5, 12-15 and 21 have now been rejected under 35 U.S.C. §102 as being anticipated by newly-cited U.S. Pat. No. 3,903,698 to Gellatly et al while Claims 1, 2, 4, 6, 10, 12-17, 20 and 21 have been rejected as anticipated by newly-cited U.S. Pat. No. 5,329,767 to Hewett and Claims 3, 5, 7-9, 11, 18 and 19 rejected under 35 U.S.C. §103 as obvious over Hewett in view of previously-cited U.S. Pat. No. 4,761,954 to Rosman.

However, it is respectfully submitted the invention as recited in all pending claims herein is patentable over this applied art, for the following reasons.

Gellatly et al disclose a bi-rotational pump 12 reversibly actuated by motor 13 (column 3, lines 36-50), unlike the present invention where opening check valve 15 allows reverse flow of hydraulic fluid in the circuit 11 and utilizing mechanical energy to re-charge the batteries 14 in motor 13 (page 10, lines 1-25). A bifurcated return circuit 37, 38 is also provided in Gellatly et al, with check valve 36 positioned at a different location from check valve 15 in the present invention as illustrated in Fig. 1 and recited in Claims 1 and 21. Furthermore, two separate fluid reservoirs 18 and 41 are provided in the embodiment of Fig. 1 in Gellatly et al.

Hewett illustrates a system in which a bidirectional pump 30 pumps fluid to chamber 18 to lift the load 28 in one direction (Fig. 1) and transfers energy from the load 28 to the motor 31 in an opposite direction (Fig. 2) by fluid being forced from chamber 18 through the pump 30 as described at column 4, lines 4-38. There is no valve positioned between pump 30 and any of the piston 16 cylinder 12 chambers 14

and 18. In this regard, the Examiner appears to suggest, at page 3 of the Office Action, the independent claim be amended to recite position of check valve 15. Furthermore, a two-position circulation valve 42 is utilized for connecting the various circulation lines to a fluid supply or reservoir 50 in Hewett.

Accordingly, independent Claim 1 has been amended to recite, among other features, the single valve 15 is positioned in the first or second passage adjacent the hydraulic means 1 without intervening conduit lines being joined to the first or second passage therebetween. Independent Claim 1 has also been amended to recite the hydraulic drive means 1 is coupled to a load 6 to move the same, and single pump 12

(i) pumps fluid in one direction to the hydraulic means 1 through the single valve 15 to move the load 6 coupled to the hydraulic means 1, and

(ii) receives energy from the load 6 through the hydraulic means 1 causing fluid to flow in an opposite direction through the single pump 12 and transfer this energy to the motor 13.

Dependent Claims 22-25 added herein are directed to the features of opening the single valve 15 to generate flow in a direction opposite to flow generated by the pump 12, by allowing the load 6 to move the piston 2 in a direction opposite to movement of the piston 2 generated by the pump 12, and controlling rate of movement of the piston 2 by the load 6 by additionally powering the pump 12 with the motor 13. Thus as previously pointed out, the present invention explicitly improves over prior art hydraulic systems in which fluid flow is controlled by a series of valves such as throttle or directional valves as shown, e.g., in Hewett and Gellatly et al. Such control with valves generate heat, in turn necessitating expensive cooling arrangements.

In contrast, with the present invention hydraulic fluid flow is substantially controlled only by the pump 12 in the hydraulic system. In other words, flow of hydraulic fluid to and from a cylinder 1 forming part of the hydraulic means is not controlled by any valves in the fluid flow circuit 11 in which the pump 12 and cylinder 1 are positioned. As also pointed out previously, unnecessary generation of heat and concomitant energy loss are avoided, while the pump 12 need only be powered when the hydraulic cylinder 1 is actually operated. Furthermore, work from the pump 12 is directly related to controlling the hydraulic means 1.

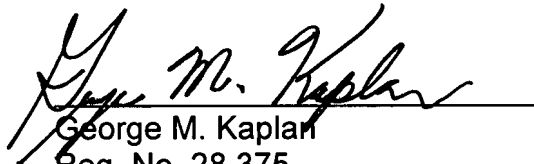
Thus, e.g., smaller movement of the piston 2 within the cylinder 1 requires less work by the pump 12. Less overall hydraulic fluid is required in the inventive system with need to superfluously circulate hydraulic fluid to maintain desired control having been eliminated. The motor 13 arranged to power the pump 12 can also be used for regenerating energy obtained from the hydraulic drive means 1 (no further devices for regenerating energy need be required). In this regard, reverse fluid and regeneration can be easily attained by shutting of pump 12 and simply opening valve 15 (a passive valve) to allow piston 2 to be moved in the opposite direction by load 6 (please see, e.g., Claims 22-25 added herein).

Rosman adds nothing to Hewett which would render obvious the invention recited in any pending claim. The remaining art of record has not been applied against the claims and will not be commented upon further at this time.

Accordingly, in view of the forgoing amendment and accompanying remarks, it is respectfully submitted all claims pending in the above-identified application are in condition for allowance. Please contact the undersigned attorney should there be any questions. The fee for the additional claims introduced herein is enclosed.

Early favorable action is earnestly solicited.

Respectfully submitted,


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